

REMARKS

By the present amendment, claims 8-9 and 14 -20 are pending in the application.

Claim Amendments

Claims 8, 14 & 16

Support for the amendments to independent claims 8, 14 and 16 is as follows.

Independent claims 8, 14 and 16 are directed to embodiments of the present invention illustrated in Figs. 12(a) and 12(b). With reference to Figs. 12(a) and 12(b), split tee 4 has a flange 5 and a web 6. Space keeping members 24 maintain a space between the flange 5 of split tee 4 and the steel column 1. Figs. 12(a) clearly illustrate that the web 6 of the split tee 4 has an extended direction parallel to the longitudinal direction of the steel beam 7.

Claims 18, 19 & 20

Support for the amendments to independent claims 18, 19 and 20 is as follows.

Independent claims 18, 19 and 20 are directed to embodiments of the present invention illustrated in Figs. 13(a) and 13(b). With reference to Figs. 13(a) and 13(b), split tee 4 has a flange 5 and a web 6. The reduced thickness of the flange 5 is illustrated as reference number 65. With reference to Fig. 12(a), web 6 of the split tee 4 has an extended direction parallel to the longitudinal direction of steel beam 7.

§112, ¶2

Claims 8, 14, 16 and 18 to 20 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Office Action made the following statements with respect to the 35 U.S.C. §112, second paragraph, rejection at page 2 of the Office Action.

For claims 8, 14 and 16:

The phrase "maintaining the space at least at the region corresponding to the extended direction of the web of the split tee" lacks a clear meaning. The "space" and the "extended direction of the web" lack positive antecedents. The claims with the phrase will be considered as originally claimed until they are corrected.

For claims 18, 19 and 20:

The phrase "at least at the region corresponding to the extended direction of the web of the split tee" lacks a clear meaning. The "extended direction of the web" lacks a positive antecedent basis in the claims and the specification. The claims with the phrase will be considered as originally claimed until they are corrected.

In response to these rejections, the claims have been amended by the present amendment. It is believed that the amended claims of the present amendment fully address the issues raised in the rejections under 35 U.S.C. §112, second paragraph. Support for the amended claims has been previously discussed.

It is therefore respectfully requested that the rejection under 35 U.S.C. §112, second paragraph, as applied to the amended claims, be withdrawn.

§103

Claims 8, 9 and 14 to 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,059,482 to Beauvoir in view of U.S. Patent No. 4,905,436 to Matsuo et al.

This rejection, as applied to the amended claims, is respectfully traversed.

With respect to the claim amendments of the Amendment filed August 21, 2006 (Certificate of Mailing dated August 17, 2006), the Office Action stated at page 4 under the heading "Response to Arguments":

Applicant's arguments are based on the amendment adding the text indicated above in the 112 rejection. This newly added text has not been considered until

the antecedent basis rejection or 35 USC 112 rejection has been clarified.

It is submitted that the present amendment overcomes the rejection under 35 U.S.C. §112, second paragraph. It is therefore respectfully requested that the patentability of the amended claims over the prior art be determined considering all the limitations appearing in the amended claims.

Present Invention

The present invention provides a column-and-beam join structure capable of plasticizing a split tee in advance of a steel beam or a steel column by using a split tee which can secure energy absorption by providing an energy absorbing function to the flange of the split tee, which is connected to the steel column by using bolts, so that the energy caused by earthquake, strong wind and the like can be effectively absorbed by the flange of the split tee, thus avoiding damage to the column and the beam.

According to the present invention, when a large external force acts on the structure, the flange of the split tee is plasticized and deformed at a space between the flange of the split tee and the steel column provided by the space keeping members or by a partially reduced thickness of the flange of the split tee prior to other parts thereof and the column and the beam.

Since the plasticization and/or deformation of the flange of the split tee absorbs the energy of an external force, deformation is limited to the flange of the split tee and the flange of the column is not damaged.

As the result, the structure can be reconstructed by only replacing the plasticized split tees without replacing the column.

In order to plasticized the flange of the split tee prior to other part thereof and the column and the beam, it is important to provide a space for the flange of the split tee to

deform between the flange of column and the flange of the split tee at least at the region corresponding to the extended direction of the web of the split tee, wherein the extended direction of the web is the direction parallel to the longitudinal direction of the steel beam.

According to the present invention, in order to provide this space, (i) space keeping members 24 are provided between the flange of column and the flange of the split tee, or (ii) a partially reduced thickness portion 65 is provided to the flange split tee at least at the region corresponding to the extended direction of the web of the split tee.

i) As shown in Fig. 12(a), the space keeping members 24 are inserted between the flange of the column and the flange 5 of the split tee.

The flange 5 of the split tee 4 and the steel column 1 are connected in the state of maintaining a space at least at the region corresponding to the extended direction of the web of the split tee (Claims 8, 14 and 16). The extended direction of the web 6 of the split tee is the direction parallel to the longitudinal direction of the steel beam 7.

(ii) The space may be provided by partially reducing the thickness 65 of the flange 5 of the split tee.

As shown in Fig. 13(a) and Fig. 13(b), a partially reduced thickness 65 of the flange 5 is provided at least at the region corresponding to the extended direction of the web of the split tee (Claims 18, 19 and 20). The extended direction of the web 6 of the split tee is the direction parallel to the longitudinal direction of the steel beam 7.

Further, in a case where the space keeping members 24 are provided as explained in (i) above, in order to make the plasticization of the flange of the split tee further effective, it is also possible to combine a split tee having a partially reduced cross sectional area of the flange as shown in Figs. 13(a), 13(b), 14(a), 14(b) and 15(a) to 15(c) with the space keeping members (Claims 9, 15 and 17).

Note that, in this case, the portion where the partially reduced cross sectional area of the flange of the split tee is provided is not necessarily limited to the region corresponding to the extended direction of the web of the split tee as is illustrated in the above Figures.

Patentability

U.S. Patent No. 6,059,482 ("US '482") relates to a bolted connector (split tee) for connecting beams to columns.

The connector of US '482 has a web having a partially reduced portion (thickness) and a flange having a tapered flange.

However, this connector is made by die cast with a block of flange and has materially poor deformability.

Therefore, US '482 does not disclose or suggest the technical feature of the present invention where the flange of the split tee is plasticized prior to other parts thereof and the column and beam.

Though the cross-sectional area of the flange of US '482 is reduced, the flange of US '482 is merely tapered and the flange of US '482 does not have a reduced thickness promoting plasticization such as in the present invention defined in claims 18 to 20.

According to the present invention defined in claims 18 to 20, in order to plasticize the flange of the split tee prior to other parts thereof against the tensile or compressive stress exerted through the web, the thickness of the flange is partially reduced at least at the region corresponding to the extended direction of the web of the split tee.

Since, the shape and portion where the partially reduced cross-sectional area portion (thickness) of the flange of the present invention is different than in US '482, US '482 does not disclose or suggest the present invention.

US '482 also discloses yield strength of the connector.

However, US '482 merely discloses a relationship of yield strength of the steel material between the connector and columns or beams, and does not disclose or suggest to limit within a specific range of the yield strength of steel material used for the split tee.

As described on page 14, line 37 to page 15, line 34 of the specification, the limitation of upper limit and lower limit of the yield stress of the steel material used for the flange of the split tee reduces the cost of the structure because the cross-sectional area of the column can be reduced.

In the structural design, when yield strength of at least the flange of the split tee broadly varies, the dimension of the flange of the split tee and/or the structure design has to be changed in order to obtain energy absorption effect explained above, and it causes cost to increase.

Therefore, by limiting the variation of yield strength of the split tee within the specific range, cost increases due to the dimensional design change and structural design change can be reduced.

US '482 does not disclose or suggest that upper limit and lower limit of the yield stress of the steel material used at least for the flange of the split tee is to be limited to the specific range.

U.S. Patent No. 4,905,436 ("US '436") relates to a column and beam joint structure and discloses a structure where the column 1 and beam 2 are joined by connector 3 using bolts.

As shown in Fig. 9 of US '436 reinforcing plates 9 are inserted between the flange of connector and the flange of the column.

As shown in Figs. 1 and 2 of US '436, these reinforcing plates are to prevent the flange of the column from deforming by the tensile or compressive stress acting on the flange of the column when bending is exerted on the joint portion.

Therefore, the reinforcing plates of US '436 are welded to the surface of the flange of the column.

Further, US '436 does not provide a space between the flange of the column and the flange of the connector, which serves as a deforming space of the flange of the split tee in the present invention, and which is located at least at the region corresponding to the extended direction of the web of the split tee.

Therefore, these reinforcing plates of US '436 cannot have a function to plasticize the flange of the split tee prior to other parts thereof, and the column and the beam.

The reinforcing plates of US '436 are different from the space keeping members of the present invention defined in claims 8, 14 and 16 and do not disclose or suggest the space keeping members of the present invention.

It is therefore submitted that claim 8-9 and 14-20 are patentable over U.S. Patent No. 6,059,482 to Beauvoir in view of U.S. Patent No. 4,905,436 to Matsuo et al.

CONCLUSION

It is submitted that in view of the present amendment and the forgoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

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